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NASA Procedural Requirements

COMPLIANCE IS MANDATORY**NPR 2570.1B**Effective Date:
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Request Notification of Change

(NASA Only)

Subject: NASA Radio Frequency (RF) Spectrum Management Manual

Responsible Office: Space Operations Mission Directorate

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Appendix G: IRAC Spectrum Planning Subcommittee (SPS) and IRAC Space Systems Subcommittee (SSS)

G.1 IRAC Spectrum Planning Subcommittee

Details of the NTIA Systems Review process can be found in the NTIA Manual Chapter 10. Note also Section 1.2 of this NPR. Briefly, the procedure consists of a four-stage review performed by NTIA's Systems Review Branch in the IRAC SPS. Note that this review process is mandatory for space systems except those that operate under Annex K of the NTIA Manual regarding low power nonlicensed devices.

All data shall be submitted by the responsible Center/Facility Spectrum Manager to the NASA SPS Representative (in either EI-CID or the current successor) in accordance with paragraph 10.7 and on the following forms found in chapter 10 of the NTIA Manual:

- NTIA Form 33 Transmitter equipment characteristics.
- NTIA Form 34 Receiver equipment characteristics.
- NTIA Form 35 Antenna equipment characteristics.

Stage 1 Conceptual

Here the initial planning effort has been completed, including proposed frequency bands and other available characteristics.

The Stage 1 Systems Review addresses the certification of spectrum support for

telecommunication systems or subsystems and provides guidance on the feasibility of obtaining certification of spectrum support at subsequent stages. Those systems or subsystems that have a major impact on spectrum usage as defined by user agencies, IRAC, or NTIA, especially those that use new technological concepts or use existing technology in significant new ways, should be submitted. The guidance provided will indicate any modification, including more suitable frequency bands, necessary to ensure conformance with the Tables of Frequency Allocations and the provisions of Chapter 5 {Spectrum Standards} of the NTIA Manual.

Because much of the system data will be estimated, in analyses performed by the Systems Review Branch leading to certification of spectrum support, only gross calculations may be achievable for a general evaluation of spectrum impact and will be subject to adjustment during later stages. The system will be reviewed in conformance to International and National Allocation Tables. In addition, checks will be made against existing standards and sharing criteria, comparison will be made with known similar systems, and spectrum efficiency will be considered.

Note that with Stage 1 approval, the Agency may not apply for a temporary frequency assignment. Temporary frequency assignments are available after Stage 2 SPS approvals and above.

Stage 2 Experimental

The preliminary design has been completed, and radiation, using test equipment or preliminary models, may be required.

Information identified in the Stage 1 Systems Review should be enhanced to make it current. Additionally, information required by Appendix 4 of the ITU RR shall be furnished to the SSS in accordance with the instructions in the current NTIA Manual for the purposes of ITU-R Advance Publication. This data may be used in lieu of the data required for Stage 1 or 2 Systems Review request. The Appendix 4 data shall be provided to the SSS at the same time as the request for Stage 2 Systems Review

The Advance Publication Information should be submitted not earlier than seven years and, preferably, not later than two years before bringing the frequency assignments into use. There is no minimum time period but, as a practical matter, if coordination and/or agreement are required, the information should be submitted at least two years before bringing the frequency assignments into use. Advanced publication may be waived, by the NTIA, if the system will be operational for less than one year and the system requests a waiver from the SSS of the IRAC.

Certification of spectrum support for telecommunication systems or subsystems at Stage 2 is a prerequisite for NTIA authorization of radiation in support of experimentation for space systems. It also provides guidance for ensuring certification of spectrum support at subsequent stages. Certification, at Stage 2, may be requested for test equipment modified operational equipment or initial design models that can be used to determine which of several frequency bands or which of several proposed equipment configurations should be selected for continued investigation.

In the review leading to certification of spectrum support at Stage 2, an evaluation of the system conformance to NTIA Manual Chapter 5, Spectrum Standards, is performed along with an assessment of the system usage for war emergencies and verification that Appendix 4 of the ITU RR is satisfied. A general analysis will be applied by the SPS, where appropriate, with more specific Electromagnetic Compatibility (EMC) analysis,

against a typical environment, being added where experimental testing of technically defined equipments is involved. Recommendations for changes to equipment characteristics and contemplated operational employment and deployment will be provided when appropriate. Calculations required in connection with national and international space coordination procedures in accordance with the methods of Appendices 28 and 29 of the ITU RR will be performed to the extent practicable.

After the SPS Stage 2 review is approved, the Agency may forward a request to the FAS to obtain the necessary frequency assignment. See Section 3.3 of this NPR. At this stage, the frequency assignment request should be for a trial assignment for the location at which the system will be tested. A planning assignment may also be applied for in anticipation of the operational {Stage 4} approval.

Stage 3 Developmental

Here the major design has been completed, and radiation may be required during testing. For the Stage 3 Systems Review, the Agency shall update the information already provided and include as a minimum:

- (1) For each Earth station transmitter and receiver site:
 - (a) Frequencies or frequency bands and satellites to be accessed.
 - (b) Coordinates.
 - (c) Emission designator for each frequency or frequency band.
 - (d) Maximum spectral power density and output power for each frequency or frequency band.
 - (e) Lowest equivalent satellite link noise temperature and associated value of transmission gain for each frequency or frequency band (geostationary satellites with simple frequency changing transponders only).
 - (f) Antenna gain and beamwidth.
 - (g) Minimum elevation angle of antenna main beam.
 - (h) Range of azimuth angles.
 - (i) Lowest total receiver noise temperature (when (e) is not appropriate).
- (2) For each Space Station transmitter and receiver:
 - (a) Frequency or frequency bands and cooperating Earth stations.
 - (b) Satellite orbital information.
 - (c) Emission designator for each frequency or frequency band.
 - (d) Peak power and spectral power density for each frequency or frequency band for transmitters.
 - (e) Receiver noise temperature.
 - (f) Transmitter antenna patterns (only if power flux density limits are exceeded).

Following receipt of these data, the SPS will initiate the Stage 3 Systems Review.

Certification of spectrum support for telecommunication systems or subsystems at Stage 3 is a prerequisite for NTIA authorization of radiation in support of developmental testing for systems that are subject to these procedures. It also provides guidelines for assuring certification of spectrum support at Stage 4. At this point, the intended frequency band will normally have been determined and certification at Stage 3 will be required for testing of proposed operational hardware and potential equipment configurations.

Detailed EMC analyses will be performed using test data and considering specific sites of equipment. A radiation hazard evaluation will be performed using ANSI-C95.1 maximum permissible exposure limits as the standard by or with the Center/Facility Radiation Safety Officer. Appropriate recommendations as to equipment characteristics or operational deployment will be developed. Calculations, in connection with national and international space system coordination procedures, will be performed or updated as appropriate.

After the Stage 3 approval, the Agency, through the FAS representative, should apply for or upgrade a temporary frequency assignment. This also applies to any planning assignments extant.

Stage 4 Operational

Here development has been essentially completed, and final operating constraints or restrictions required ensuring compatibility needs to be identified. All telemetry, tracking and control equipment is required to have NTIA Stage 4 System Certification before their use.

When submitting for Stage 4 Systems Review, NASA shall update all previous information provided.

Certification of spectrum support for telecommunication systems or subsystems at Stage 4 is a prerequisite for an NTIA RFA for a station with an operational station class (i.e., other than experimental) for systems that are subject to these procedures. Both the Stage 4 Certification of Spectrum Support and the RFA may provide restrictions on the operation of the system or subsystems as may be necessary to prevent harmful interference. In analyses leading to certification of spectrum support at Stage 4, detailed EMC analyses will be updated by the submitting Center, as required, to include consideration of frequency assignments for specific system deployment. Appropriate recommendations as to equipment characteristics and/or operational limitations will be provided. Having completed the SPS review process, application may be made by the Agency, through the FAS Representative, for an operational frequency assignment.

G.2 IRAC Space Systems Subcommittee

The SSS of the IRAC will review the information provided by the Agency prior to initiating the international Advance Publication, Coordination and/or Notification process through the ITU-R. The SSS also provides a mechanism for NASA to provide comments at a national level back to foreign governments with respect to their planned operations.

For unclassified space systems that have not been waived from the requirements of international registration, information shall be prepared in specific formats and submitted by the NASA SSS representative to the SSS in accordance with Articles 9 and 11 as well as Appendix 4 of the ITU Radio Regulations and according to the provisions of Chapter 10 of the NTIA Manual. The data usually used for developing the filing

information submitted to the SSS are:

- Stage 2 SPS request for Certification for the ITU-R Advance Publication.
- Stage 4 SPS request for Certification for the ITU-R Coordination Request, if required, and Notification. When data from an existing Certification for a particular mission are insufficient for international filing requirements, the NASA SSS representative and/or alternate NASA SSS representative will work closely with Center/Facility Spectrum Managers to ensure any outstanding details may be provided, via the SSS, to the ITU-R in a timely and accurate manner.

It is recognized that the submission of information to the BR concerning Earth stations located outside the jurisdiction of the United States may be the responsibility of the country on whose territory the Earth station is located.

As a matter of policy, advance publication information and notices of frequency assignments relating to space systems shall be submitted to the BR. Exceptions to this policy will be made only by the NTIA on a case-by-case basis.

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